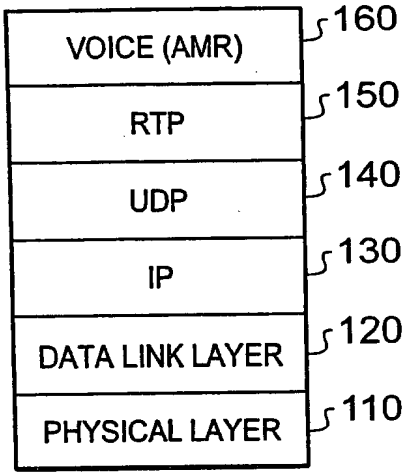
VOICE (AMR)
160
RTP
150
UDP
140
IP
130
DATA LINK LAYER
120
PHYSICAL LAYER
110

Fig. 1

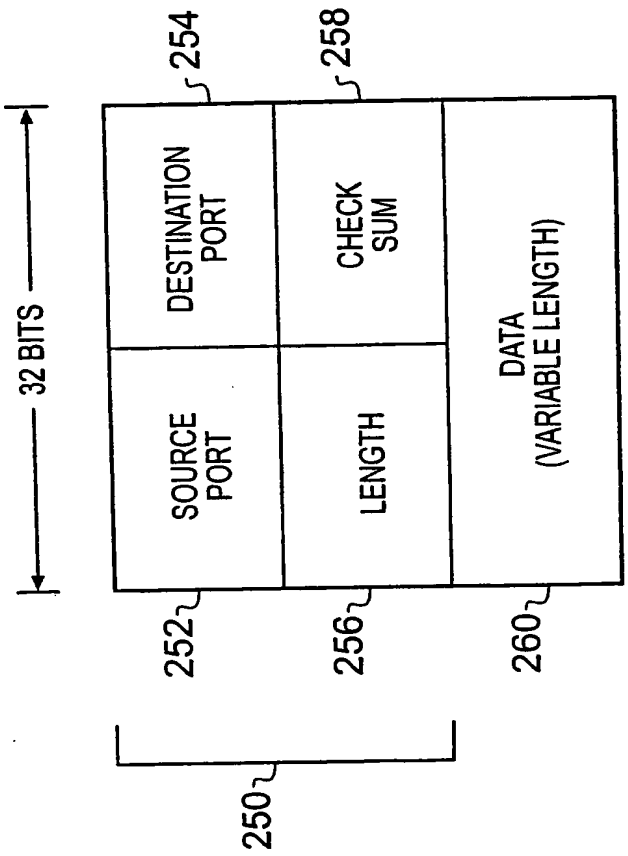
32 BITS
SOURCE PORT
DESTINATION PORT
LENGTH
CHECK SUM
DATA (VARIABLE LENGTH)
252
254
256
258
260
250

Fig. 2

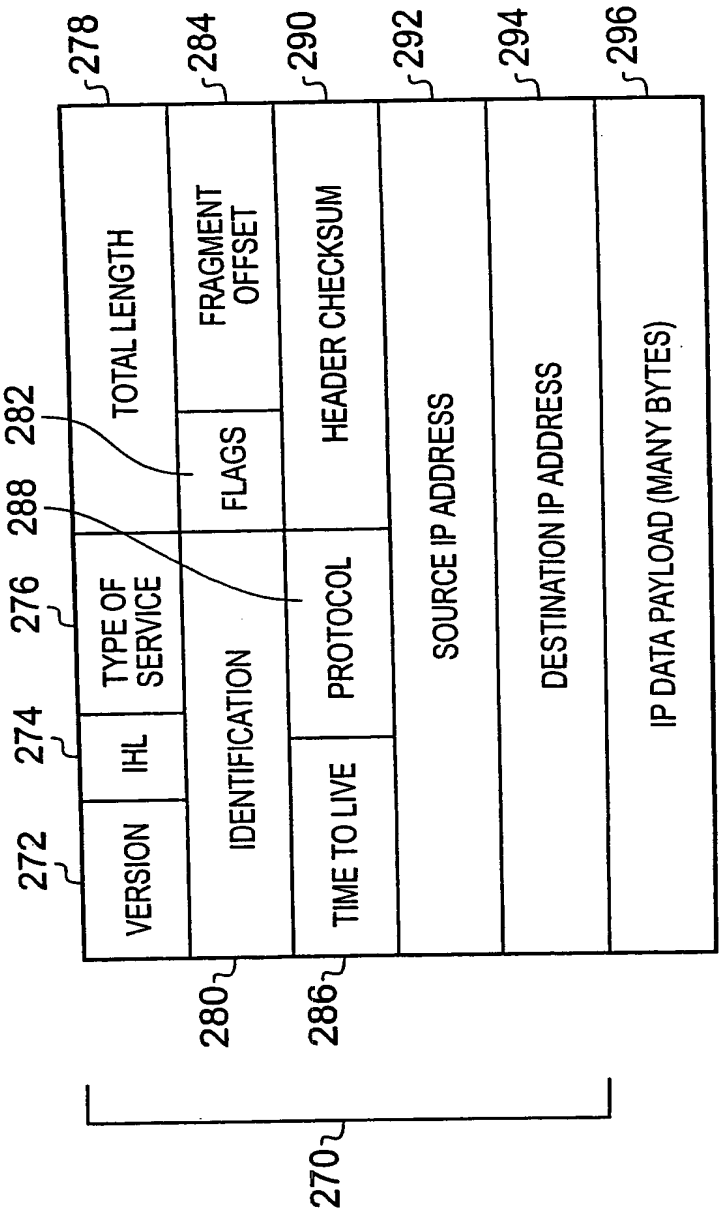
VERSION
IHL
TYPE OF SERVICE
TOTAL LENGTH
IDENTIFICATION
FLAGS
FRAGMENT OFFSET
TIME TO LIVE
PROTOCOL
HEADER CHECKSUM
SOURCE IP ADDRESS
DESTINATION IP ADDRESS
IP DATA PAYLOAD (MANY BYTES)
270
272
274
276
278
280
282
284
286
288
290
292
294
296

Fig. 3

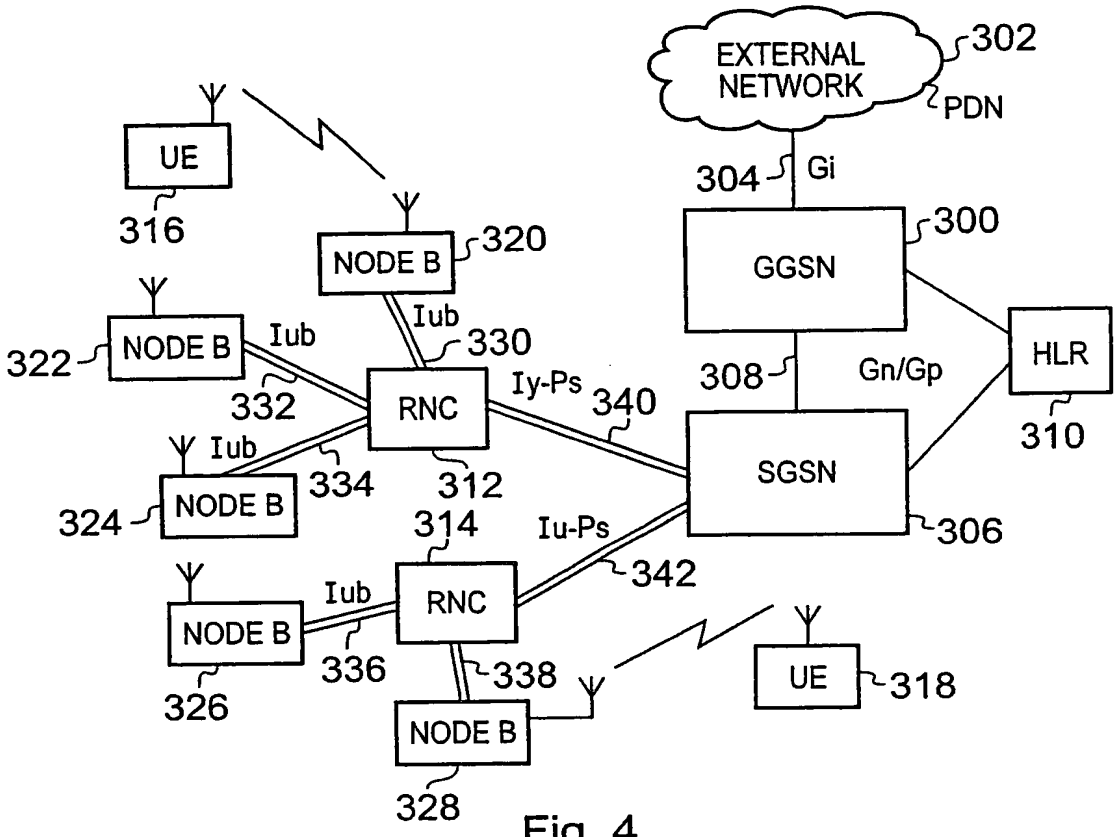
EXTERNAL NETWORK
302
PDN
304
Gi
GGSN
300
HLR
310
308
Gn/Gp
SGSN
306
UE
316
NODE B
320
322
Iub
330
332
RNC
Iy-Ps
340
334
312
324
314
Iu-Ps
342
336
338
326
328
UE
318

Fig. 4

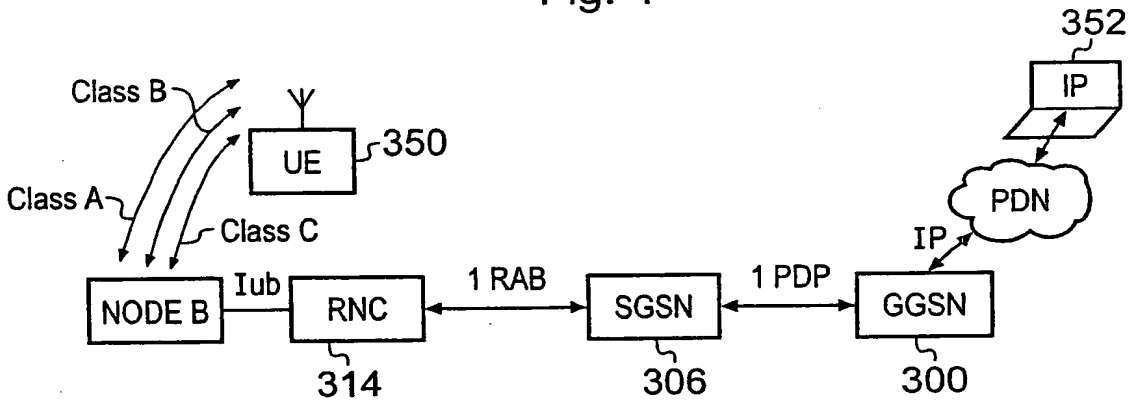
352
IP
PDN
IP
Class B
Class A
Class C
UE
350
NODE B
Iub
RNC
1 RAB
SGSN
1 PDP
GGSN
314
306
300

Fig. 5

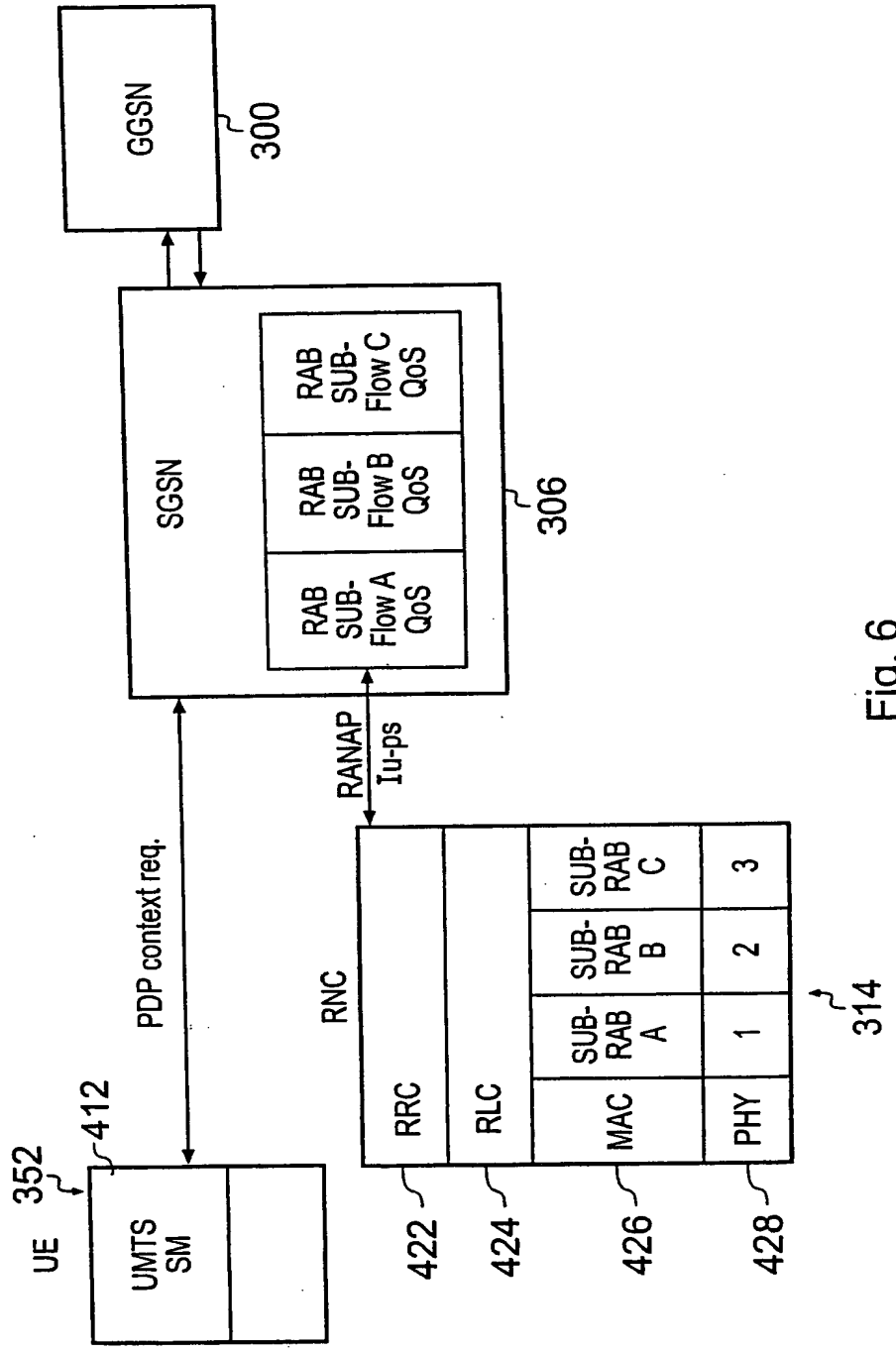
GGSN
300
SGSN
RAB SUB-Flow A QoS
RAB SUB-Flow B QoS
RAB SUB-Flow C QoS
306
RANAP
Iu-ps
PDP context req.
RNC
RRC
RLC
MAC
SUB-RAB A
SUB-RAB B
SUB-RAB C
PHY
1
2
3
314
422
424
426
428
UE
352
412
UMTS SM

Fig. 6

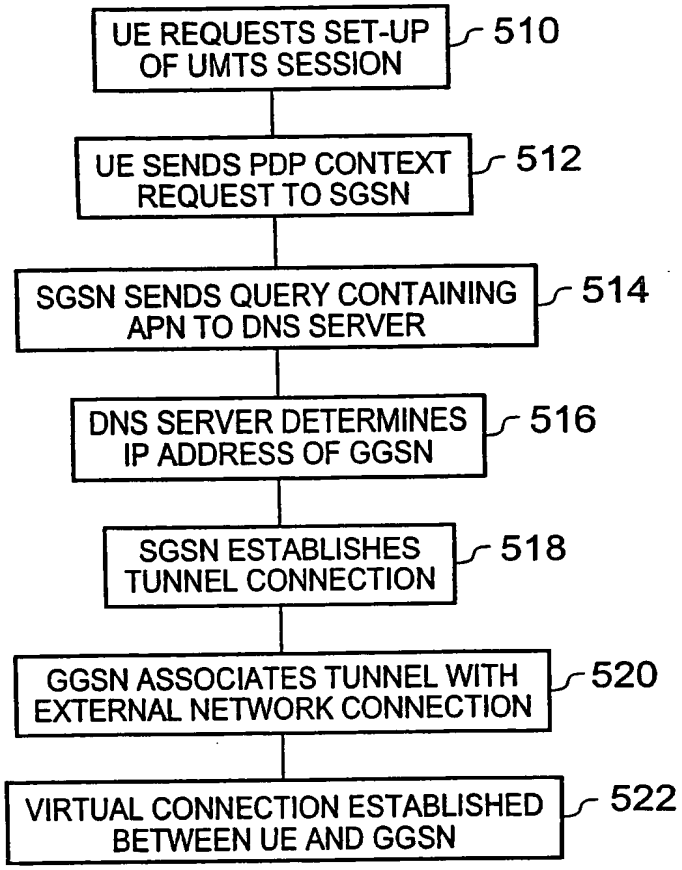
UE REQUESTS SET-UP OF UMTS SESSION
510
UE SENDS PDP CONTEXT REQUEST TO SGSN
512
SGSN SENDS QUERY CONTAINING APN TO DNS SERVER
514
DNS SERVER DETERMINES IP ADDRESS OF GGSN
516
SGSN ESTABLISHES TUNNEL CONNECTION
518
GGSN ASSOCIATES TUNNEL WITH EXTERNAL NETWORK CONNECTION
520
VIRTUAL CONNECTION ESTABLISHED BETWEEN UE AND GGSN
522

Fig. 7

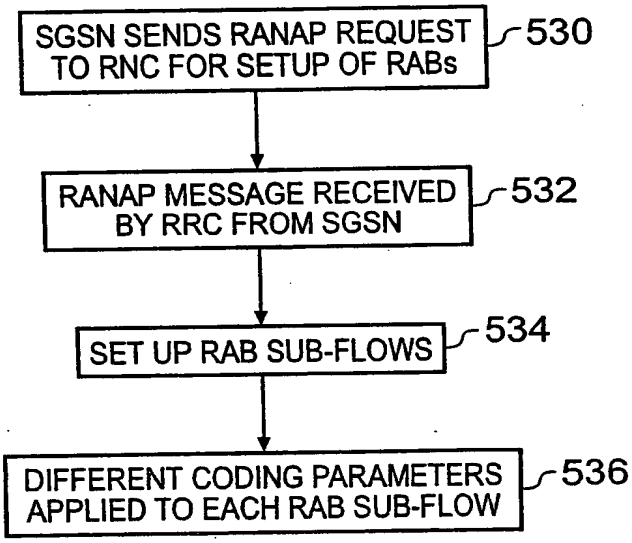
SGSN SENDS RANAP REQUEST TO RNC FOR SETUP OF RABs
530
RANAP MESSAGE RECEIVED BY RRC FROM SGSN
532
SET UP RAB SUB-FLOWS
534
DIFFERENT CODING PARAMETERS APPLIED TO EACH RAB SUB-FLOW
536

Fig. 8

Table 1

RAB service attribute	RAB service attribute value		Comments
Traffic Class	Conversational		
RAB Asymmetry Indicator	Symmetric, bidirectional		Symmetric RABs are used for uplink and downlink
Maximum bit rate	12,65 kbit/s in configurations 0 and 1 15,85 kbit/s in configurations 2 and 3 23,85 kbit/s in configurations 4 and 5		This value depends on the highest mode rate in the RFCS (note 2)
Guaranteed bit rate	6,60 kbit/s		One of the values chosen, depending on the lowest rate controllable SDU format (note 2)
Delivery Order	Yes		(note 1)
Maximum SDU size	253 in configurations 0 and 1 317 in configurations 2 and 3 477 in configurations 4 and 5		Maximum size of payload field in Iu UP, according to the highest mode rate in the RFCS (note 2)
Traffic Handling Priority	Not applicable		Parameter not applicable for the conversational traffic class (note 1)
Source statistics descriptor	Speech		(note 1)
SDU Parameters	RAB subflow 1 (Class A bits)	RAB subflow 2 (Class B bits)	The number of SDU, their number of RAB subflow is subject to operator tuning (note 3)

Fig. 9 (continued on page 9/17)

SDU error ratio	$7 * 10^{-3}$	-	(note 3)
Residual bit error ratio	10^{-6}	10^{-3}	(note 3 - applicable for every subflow)
Delivery of erroneous SDUs	Yes	-	Class A bits are delivered with error indication; Class B bits are delivered without any error indication
SDU format information 1-5			(note 4)
sub-flow SDU size 1-5	(note 5)	(note 5)	

NOTE 1: These parameters apply to all UMTS speech codec types.
NOTE 2: The guaranteed bit rate depends on the periodicity and the lowest rate controllable SDU size. All UMTS_AMR-WB configurations as defined in TS 26.103 contain the 6,60 kbps codec mode as lowest and therefore "guaranteed bit rate". The "maximum bit rate" and the " maximum SDU size" depend on the selected UMTS_AMR-WB configuration.
NOTE 3: These parameters are subject to operator tuning.
NOTE 4: SDU format information has to be specified for each AMR-WBcore frame type (i.e. with speech bits and comfort noise bits) included in the RFCS as defined in [2].
NOTE 5: The subflow SDU size corresponding to an AMR-WBcore frame type indicates the number of bits in the class A, class B fields as specified in Table 2 (see Fig.10)

Fig. 9 (continued from page 8/17)

Table 2:

Frame Type Index	No of Class A Bits per frame	No of Class B Bits per frame	No of Class C Bits per frame	Total No. of Bits per frame
1	64	113	0	198
2	72	181	0	274
3	72	213	0	306
4	72	245	0	338
5	72	293	0	386

Fig. 10

Table 3

UMTS_AMR-WB	RAB sub-flows		Total number of bits per RAB sub-flow combination (Mandatory)	Source rate
RFCI	RAB sub-flow 1 (Optioinal)	RAB sub-flow 2 (Optioinal)		
Example 1				
1	40	0	40	AMR-WB SID
2	54	78	132	AMR-WB 6.6 kbps
3	64	113	177	AMR-WB 8.85 kbps
4	72	181	253	AMR-WB 12.65 kbps
Example 2				
1	40	0	40	AMR-WB SID
2	54	78	132	AMR-WB 6.6 kbps
3	64	113	177	AMR-WB 8.85 kbps
4	72	181	253	AMR-WB 12.65 kbps
5	73	244	317	AMR-WB 15.85 kbps
Example 3				
1	40	0	40	AMR-WB SID
2	54	78	132	AMR-WB 6.6 kbps
3	64	113	177	AMR-WB 8.85 kbps
4	72	181	253	AMR-WB 12.65 kbps
5	74	403	477	AMR-WB 23.85 kbps

Fig. 11

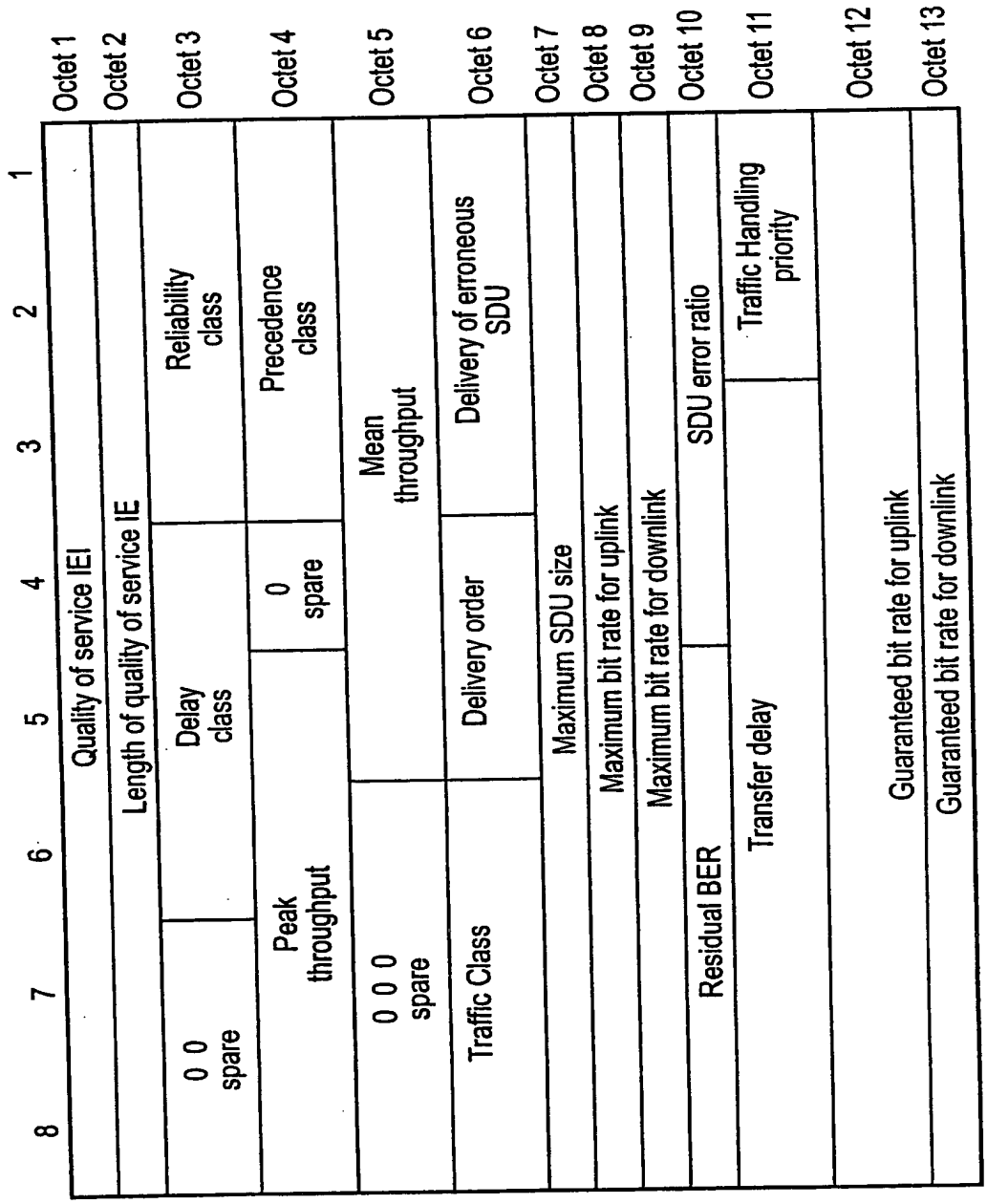
8 7 6 5 4 3 2 1
Octet 1
Quality of service IEI
Octet 2
Length of quality of service IE
Octet 3
0 0 spare
Delay class
Reliability class
Octet 4
Peak throughput
0 spare
Precedence class
Octet 5
0 0 0 spare
Mean throughput
Octet 6
Traffic Class
Delivery order
Delivery of erroneous SDU
Octet 7
Maximum SDU size
Octet 8
Maximum bit rate for uplink
Octet 9
Maximum bit rate for downlink
Octet 10
Residual BER
SDU error ratio
Octet 11
Transfer delay
Traffic Handling priority
Octet 12
Guaranteed bit rate for uplink
Octet 13
Guaranteed bit rate for downlink

Fig. 12

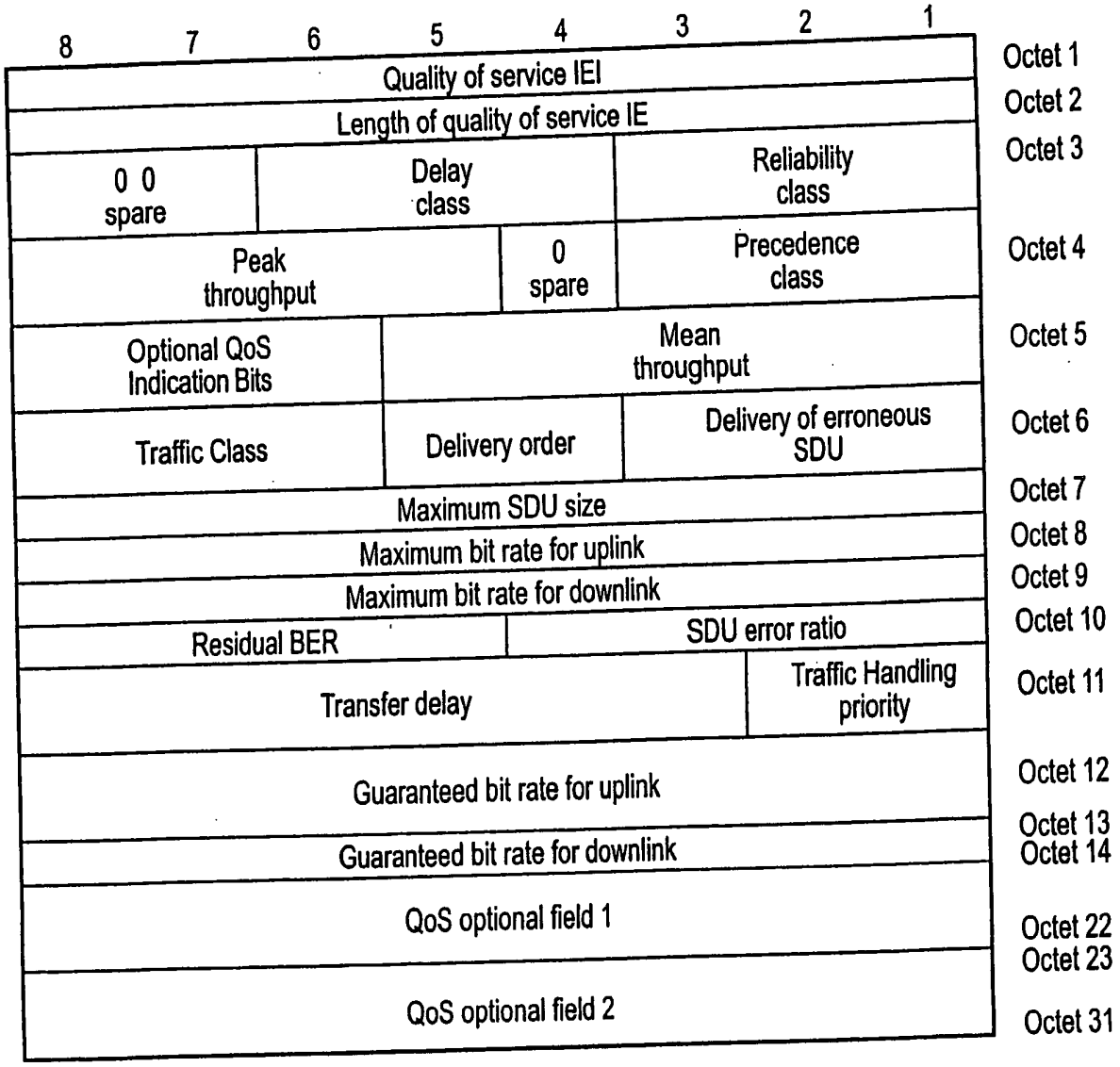

Fig. 13

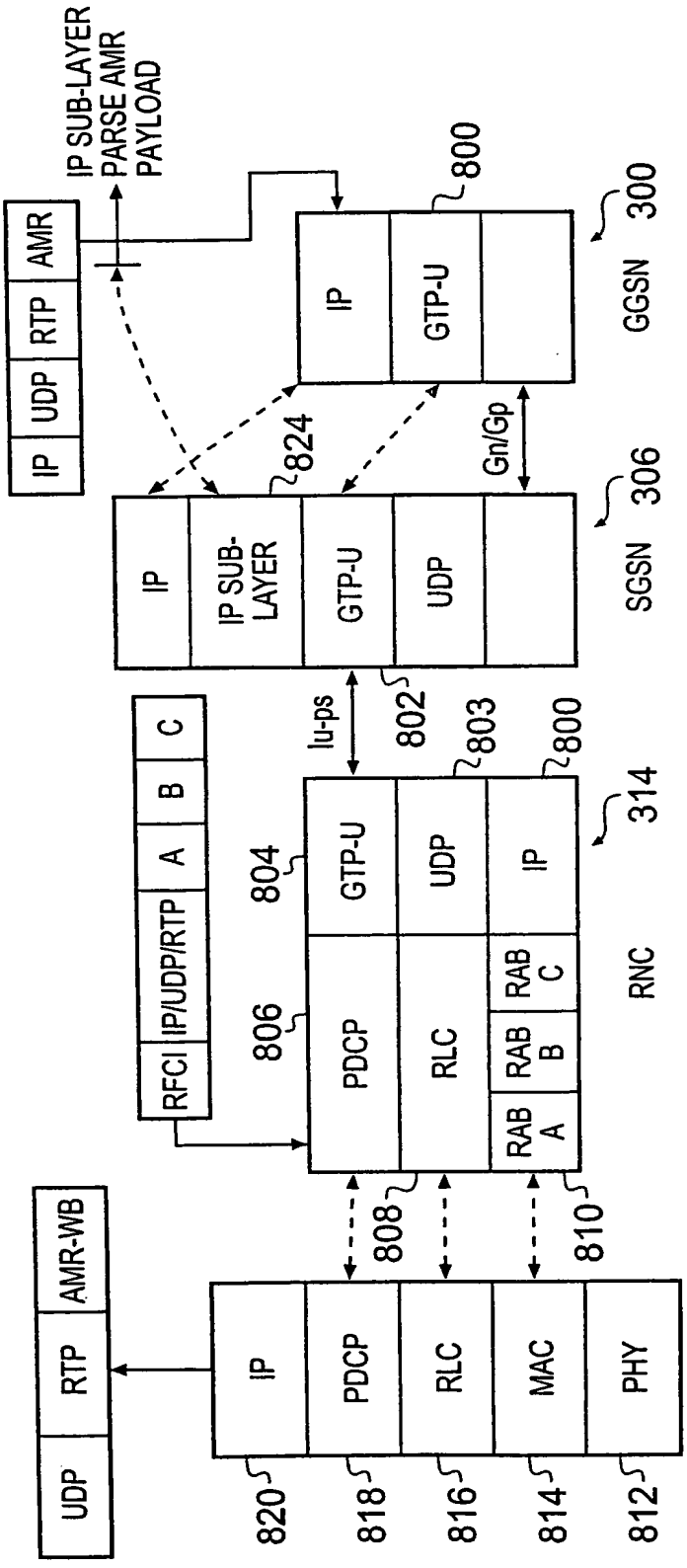
IP SUB-LAYER PARSE AMR PAYLOAD
IP
UDP
RTP
AMR
800
IP
GTP-U
GGSN
300
824
Gn/Gp
IP
IP SUB-LAYER
GTP-U
UDP
SGSN
306
Iu-ps
802
803
800
804
GTP-U
UDP
IP
314
RFCI
IP/UDP/RTP
A
B
C
806
PDCP
RLC
RAB C
RAB B
RAB A
RNC
808
810
UDP
RTP
AMR-WB
IP
PDCP
RLC
MAC
PHY
352
UE
820
818
816
814
812

Fig. 14

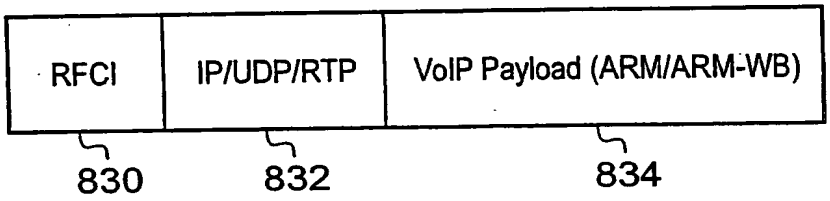

Fig. 15

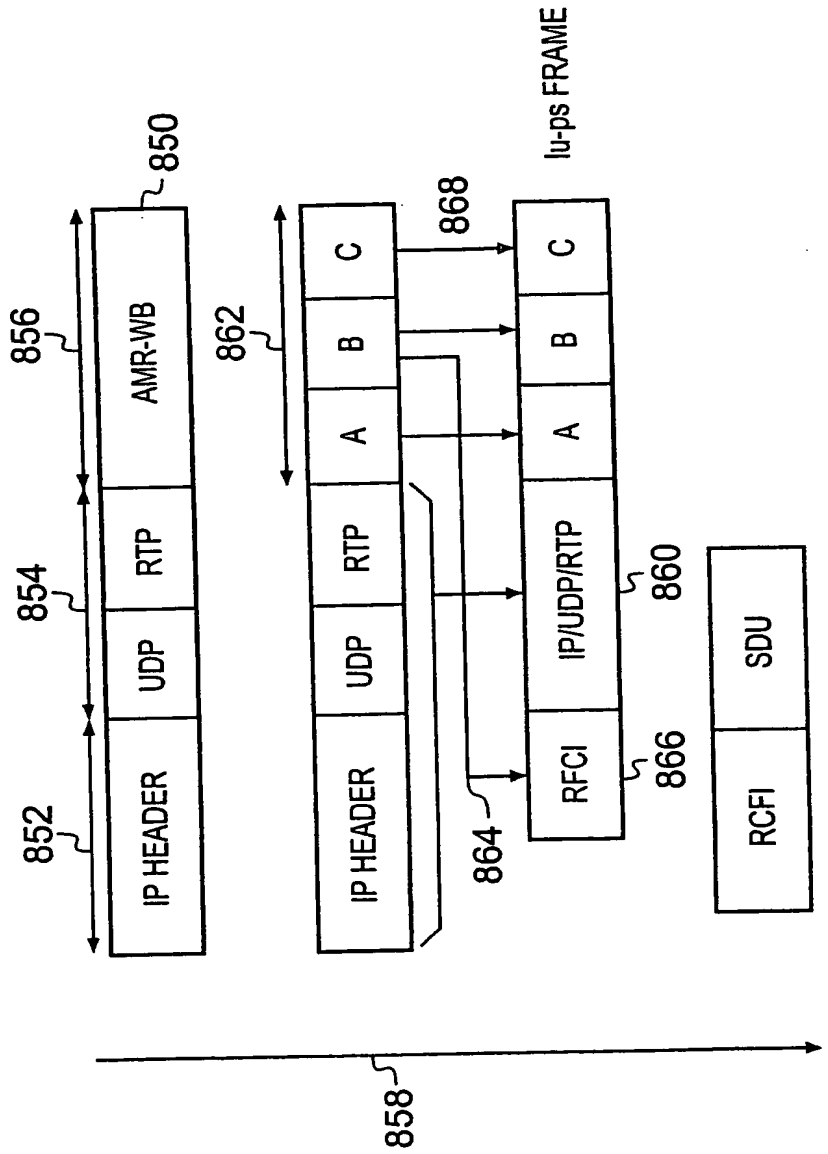
850
AMR-WB
RTP
UDP
IP HEADER
856
854
852
862
C
B
A
RTP
UDP
IP HEADER
868
Iu-ps FRAME
C
B
A
IP/UDP/RTP
RFCI
SDU
RCFI
860
866
864
858

Fig. 16

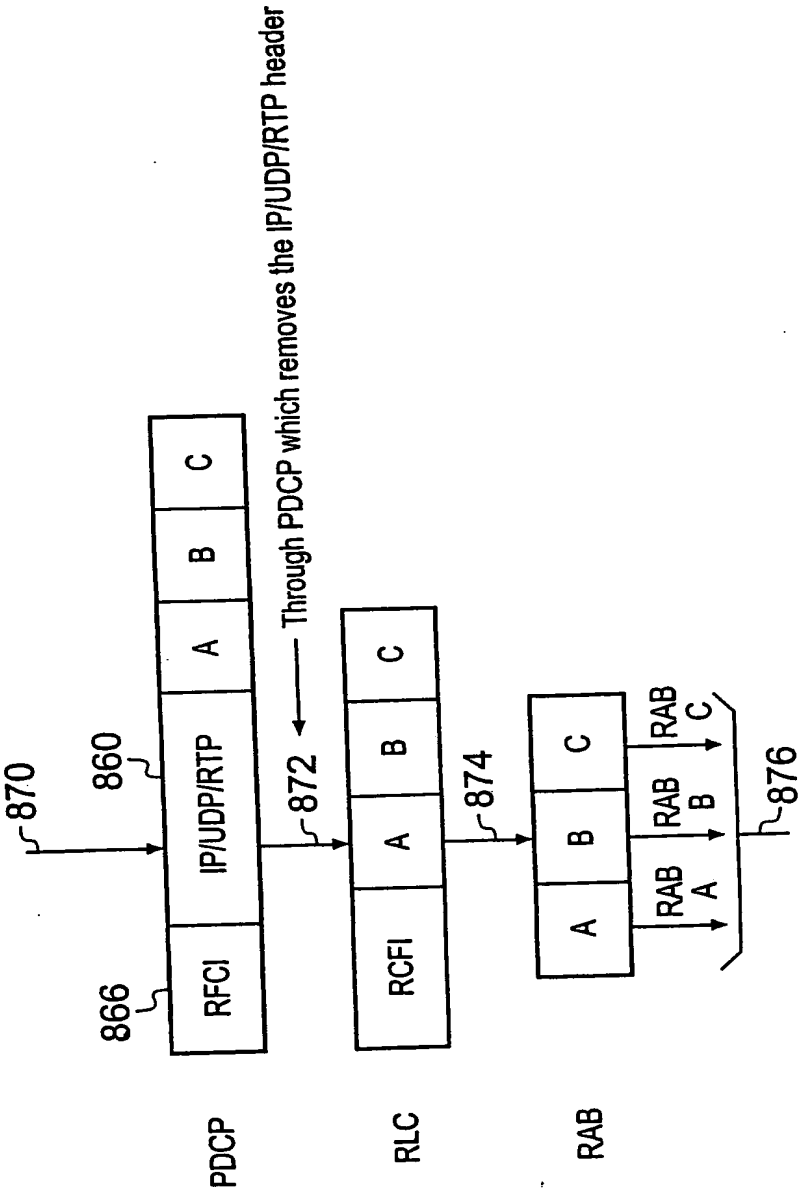
Through PDCP which removes the IP/UDP/RTP header
870
860
872
874
876
866
RFCI
IP/UDP/RTP
A
B
C
RCFI
RAB A
RAB B
RAB C
PDCP
RLC
RAB

Fig. 17